Review: Agriculture Systems based on IOT

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Abstract--- *The Internet of Things is a collection of interlinked smart devices, physical or virtual appliances, artifacts, animals and entities that have unique identifiers and the capacity to transmit information across a network despite involving human-to-human or human-to-computer communication. Thanks to the integration of various innovations, real-time computing, machine learning, product sensors, and integrated systems, the concept of "Internet of Things" has evolved. Modern areas of embedded systems, mobile sensor networks, and monitoring systems, robotics (such as home and building automation) and so on all relate to the Internet of Things. IOT is capable of influencing the world in which human beings live; specialized industries, networked vehicles and smarter towns are all part of the IOT calculation. Furthermore, the most significant influence could be the application of technology such as IOT to the farming sector. This paper shows the integration of IOT technology with other technologies to enhance agriculture practices and operations.*

Index Terms--- *Internet of Things, smart devices, human-to-computer communication, home and building automation, agriculture, agriculture practices.*

I. INTRODUCTION

Agriculture in itself is the science and art of plant and livestock cultivation. Industrial agriculture was the central innovation in the emergence of sedentary lifestyle human civilization, by which the cultivation of domesticated species produced by the food trade surpluses that actually allowed citizens to reside in cities. The history of agriculture started thousands of years ago. Nascent farmers started planting them about "11,500" years earlier after collecting wild grains starting at least "105,000" years ago. More than "10,000" years ago, pigs, sheep and cattle were domesticated. Plants are produced in at least "11" parts of the world separately. In the twentieth century, industrial farming based on multiple-scale monoculture began to overtake agricultural production, however, in the twenty-first century; approximately 3 billion citizens still relied on the subsistence farming. Agriculture exemplifies an essential enhancement in the history of humans along with the profits which come from the agriculture products.

Innovation has performed a major role in the agriculture industry's growth. Agricultural genetic engineering can be used to produce food in a desert today. With these technological advances, plants were designed to sustain in situations of drought. Scientific researchers have been able to incorporate characteristics into established mutations via genetic engineering with the intention of making crops impervious to droughts and pests. IOT is an Internet device network

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that allows web services to communicate with these objects. It is a mechanism that allows entities around us to bind in the process to one another. The IOT will “create a world where all objects are connected to the Internet and communicate with each other with minimal human intervention to optimize the use of resources to increase the quality of services offered to people and minimize the operating costs of the services” [1][2]–[7]. Agriculture characteristics use IOT information and communication and system availability, which are used in such artifacts to organize and process information. "The IOT empowers designated objects to be understood or conceivably forced crosswise over the concluded process of the existing specification, to construct open access points for all the extra obvious fusion of the considerable earth into PC-based structures, in addition to the recognition of redesigned capacity, precision and cash interlinked favorable position.

II. REVIEW

As per the paper with the title “Internet of Things in Precision Agriculture using Wireless Sensor Networks” [8], the Internet of Things (IOT) is the concept of linking significant-world entities with the internet, would fundamentally change the way people organize, access and interpret information. The Internet of Things (IOT) facilitates multiple applications (crop growth tracking and distribution, irrigation decision aid, etc.) in the area of “Digital Farming”. The “Wireless Sensors Network (WSN)” is ordinarily used for the decision-making process. In the modern world, such programs solve several challenges. “Precision Agriculture (PA)” is among the most important areas in which decision support systems are progressively required. Across sensor networks, agricultural production can be linked to the IOT, which enables them to develop ties around agronomists, farmers and crops, irrespective of their methodological differences. In the contemporary world, these systems address a number of challenges [9]–[11]. “Precision Agriculture (PA)” is one of the most significant areas under which decision support systems are gradually required. Through sensor networks, agricultural production can be connected to the IOT, which facilitates everyone to establish ties between botanists, farmers & crops, regardless of their methodological limitations. Figure1 illustrates the architecture proposed by the paper [8].

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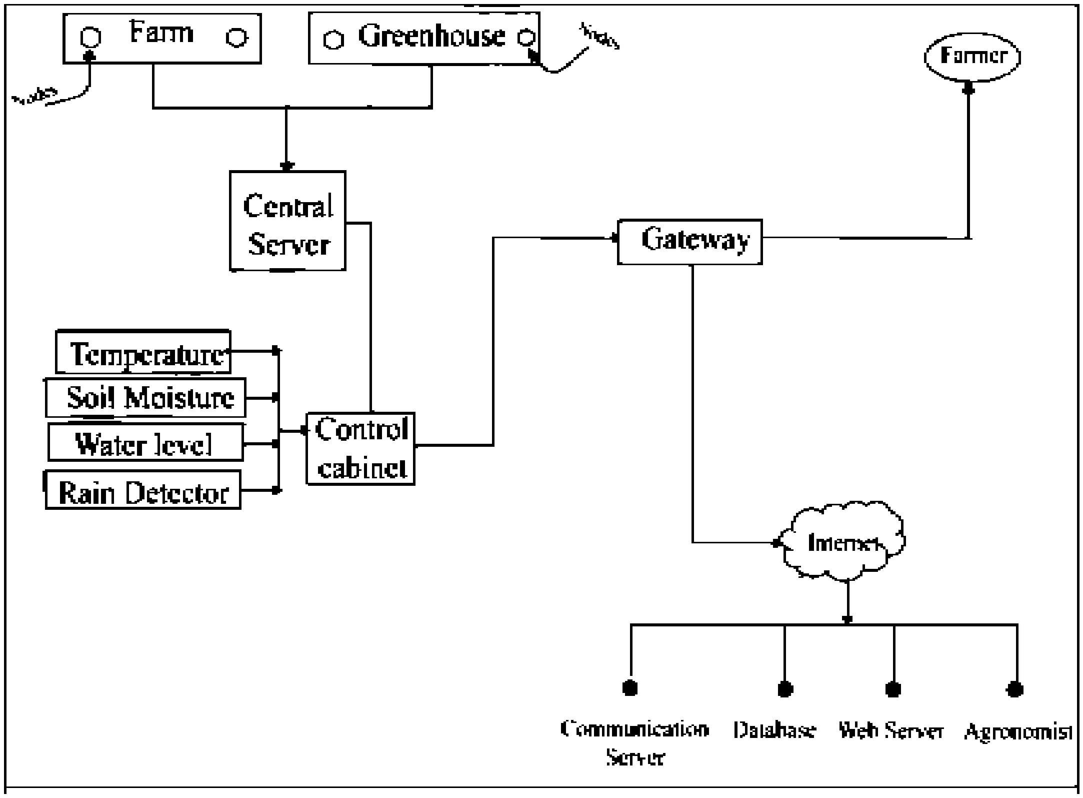

Fig.1. Proposed Architecture

In the year 2016, another paper with the title "IOT based Smart Agriculture" [4] discloses about Agriculture performs a crucial function in the advancement of farmland. In India, about "70% "of the workforce hinges on agriculture, and one-quarter of the country's capital arrives from agriculture. Agriculture difficulties have always hindered economic development. Intelligent agriculture seems to be the only alternative to this challenge by revitalizing the present traditional techniques of agricultural production. The aim of the paper was, therefore, to make smart utilization agricultural production which smartly utilizes automation and IOT innovations. The highlights of this initiative provide a smart GPS-based remote-controlled robot to complete tasks such as weeding, watering, humidity detecting, bird and pet scarring, surveillance, etc. Second, intelligent irrigation with intelligent regulates and intelligent decision-making predicated on appropriate real-time existing data. Thirdly, smart distribution center management that mostly comprises upkeep of temperature, replenishment of moisture and warning systems of theft in the warehouse [12]. Figure 2 illustrates the block diagram of the proposed system [4].

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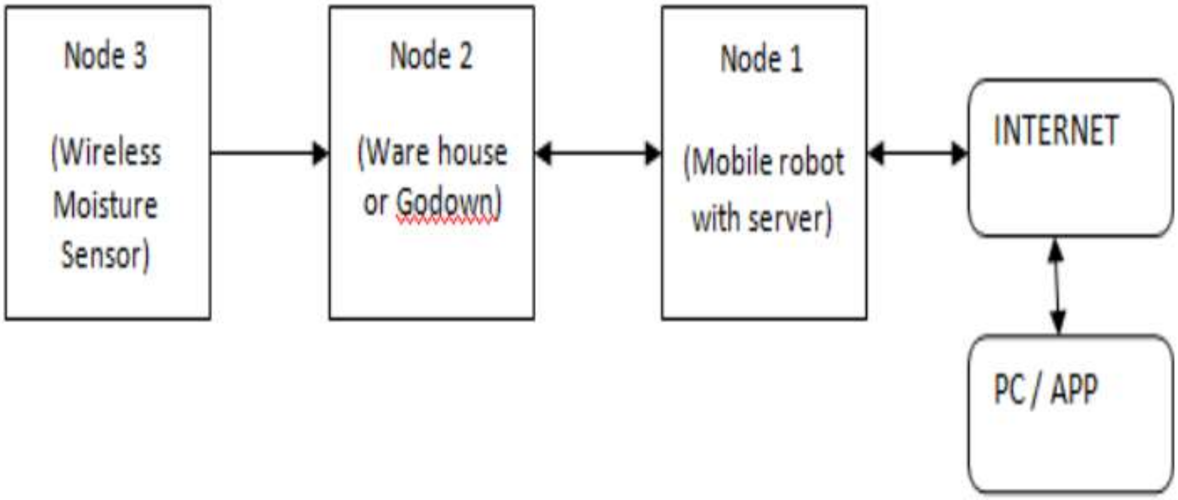

Figure 2 block diagram of the system proposed by the paper

The paper consists of four sections; node1, node2, node3, and a PC or phone computer control-app. In the current system, each node integrates with distinct detectors and operating systems and is linked to a singl e unified server via wireless communication modules. The client sends and receives data through Internet connectivity from the end-user. There are two methods of installation of the system: "auto mode" and "manual mode". Through auto mode, the computer makes its own measures and manages the activated computers, while in autonomous mode; the user may control system functioning by utilizing the Android software or PC instructions. The detectors and microprocessors of all triple nodes effectively interact with raspberry pi, and wireless connectivity among the nodes is accomplished. Both findings and preliminary trials demonstrate that the plan is a total solution to field operations, irrigation challenges and processing problems with remote-controlled vehicles, smart irrigation systems and intelligent warehouse management systems. The development of such a system in the research area can certainly help to strengthen crop yields and production value.

In the year 2017, another paper [13] disclosed the emergence of technology in the agriculture field. There is a major obstacle in farming caused by the immigration of citizens from rural to town. So, in order to address this issue, they are operated on "smart farming techniques using IOT". This includes a variety of features such as "GPS-based remote monitoring, humidity & climate sensing, scarring intruders, safety, leaf wetness and proper drainage services". It renders the constant usage of wireless sensor networks to assess soil characteristics and environmental conditions. Many sensor nodes were installed at different locations in the field.
Numerous detectors are mounted in the area, such as a temperature detector, a humidity sensor and a PIR detector. The information obtained from these detectors is linked to the microprocessor via "RS232". The collected data shall be confirmed with the threshold standards in the regulate section. If the information collected surpasses the threshold worth, the buzzer will be shifted on and the LED will start flashing. This emergency call is sent through a message to the gardener and the energy is immediately moved off after sensing. The attributes are

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obtained on the web page and the farmer is given a complete description of the ideals. Figure 3 illustrates the proposed application.

In autonomous mode, the user must convert on and off the microprocessor by pushing the button produced in the An droid implementation. This is achieved with the support of the GSM System.

Fig.3. Proposed application

In the year 2018 another paper invented an "IOT based agriculture system based on LoRaWAN"[14]. In addition to implementing smart city entries, IOT has already discovered a substantial place in the environmental and food production mechanism in recent years. The paper describes an advanced, energy-efficient and interoperable IOT agricultural system. This device is followed by a long-range "LoRaWAN infrastructure" and low-energy wireless communications from sensor nodes to cloud providers. They introduced an IOT farming network prototype that uses the LoRaWAN interface to transmit data between sensor nodes to the cloud computing and the Things, Network system which incorporates the backend capabilities of LoRaWAN. They also developed a system that is scalable and in spite of the emergence of new technologies as well as compatibility with other IOT systems. It is also dynamically adjustable, which ensures that they can maximize its efficiency by merely generating new database instances. Figure 4 illustrates the flow of data in the proposed system.

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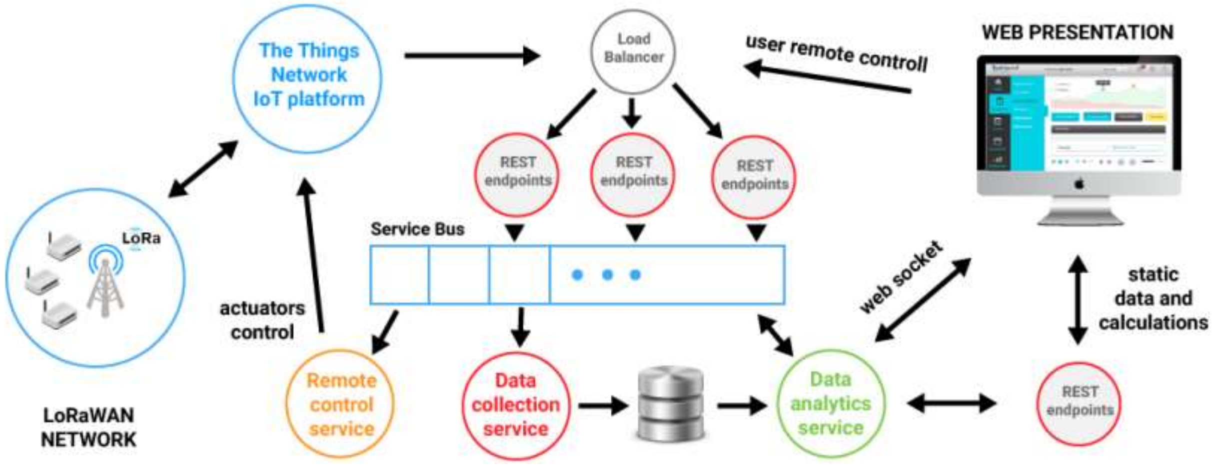

Figure 4 flow of data in the proposed system[14]

LoRaWAN clusters in their network are split into two classes (collectors and executors). Collectors are routers configured with a range of detectors that capture and transfer data to their cloud providers, whereas trustees are domains equipped with automatic sprinkler command actuators.

The entire architectural style is “flexible, scalable and extensible”. It does not rely heavily on any model and can readily be expanded to many other IOT network varieties and facilities. Its achievement can be enhanced by simply spawning new instances of cloud providers. It is incredibly necessary that IOT systems implement a layer of security. And without that, they would encounter a number of threats that could do significant harm to the manufacturing process. Lack of availability (DOS), unrecognized information and lack of data protection may cause false data analysis results, loss of quality products as well as disrupt the activity of actuators and potentially damage to crops.

In 2019, a “Smart Water Management Platform: IOT-Based Precision Irrigation for Agriculture” was introduced in paper [15]. Intelligent control of freshwater for controlled irrigation in cultivation is important for growing crop yields and lowering costs, thus leading to sustainable development. The intensive use of technology offers the possibility of supplying the precise quantity of water necessary by the crop. The Internet of Things (IOT) is a perfect choice for smart water systems projects, although the implementation of the emerging technologies needed to make it work smoothly, in reality, has not yet been fully achieved. This paper introduces the SWAMP architectural design, system and scheme installations that illustrate the replicability of the system and, as interoperability is a key concern for IOT implementations, involves a performance tuning of the FIWARE elements used throughout the system. The results suggest that it is capable of providing acceptable performance for SWAMP pilots, but involves specially engineered parameters and re-engineering of several elements to continue providing higher usability utilizing less computational manpower. Figure 5 explains the flow diagram of the proposed work in paper [15].

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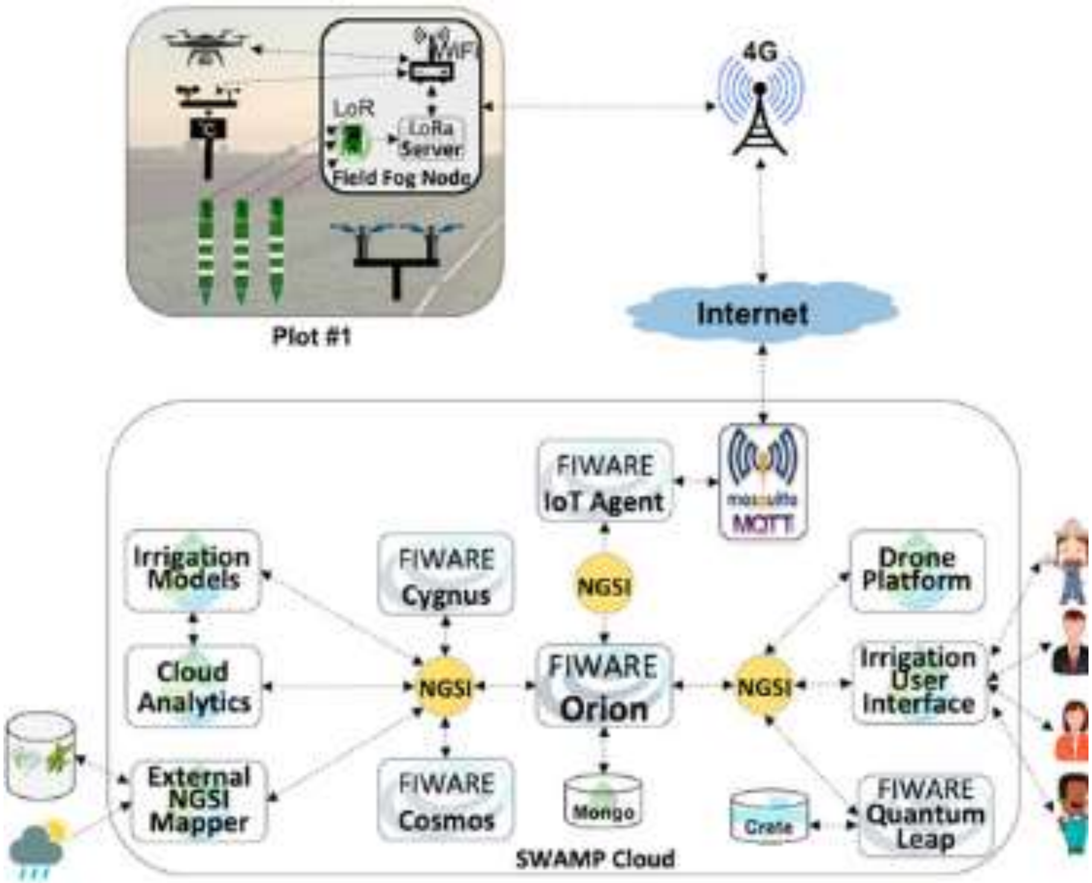

Figure 5 flow diagram of the proposed work in paper [10]

III. CONCLUSION

Increment in the rainfall is unpredictable over the past decade. Just because of that, many Indian farmers are embracing atmospheric shrewd techniques called “keen horticulture”. Shrewd farming is robotic and orchestrated data innovation that has been updated with the Internet of Things (IOT). IOT is growing rapidly and typically linked in every distant state. In this paper, mix of IOT innovation was assessed on the basis of the actual circumstances of the rural system. This paper analyzes the application of the Internet of Things (IOT) in the area of agriculture. The paper aims to inform the reader regarding IOT technology and its technical requirements in agricultural practices. This calls for a comprehensive review of its structure, principles and consequences for execution. The function of Agriculture IOT is being explored together with several real-world examples. The usage of IOT in crops and orchards would help farmers to take advantage of their software. The usage of the Internet of Things (IOT) in farming will not only increase productivity but would also properly manage all agricultural operations. Several businesses have introduced their products on the market to address the needs of producers who chose to adopt smart agriculture. Execution may have some implications, such as cost factor and lack of understanding, but it can nonetheless start working more for gaining benefits.

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